IN THE CLAIMS:

1. (Amended) An electronic system, comprising a single device and an external magnetic field, said single device having a light emitting portion, a magnetically sensitive portion, and an energy barrier, wherein an interface is between said magnetically sensitive portion and said light emitting portion, further wherein said energy barrier is between said magnetically sensitive portion and said light emitting portion, wherein said external magnetic field is aligned parallel to said interface where said external magnetic field intersects said magnetically sensitive portion, wherein a change in said external magnetic field is capable of changing magnetization of said magnetically sensitive portion in a direction parallel to said interface, wherein said change in magnetization of said magnetically sensitive portion is capable of modulating a hot electron current flowing across said energy barrier to said light emitting portion for modulating light emission from said light emitting portion.

2. (Amended) An electronic system, as recited in claim 1, wherein said single device is for converting a magnetic digital signal directly into an optical digital signal, wherein variation of said external magnetic field provides said magnetic digital signal.

3. (Previously presented) An electronic system, as recited in claim 2, wherein said single device is for converting said magnetic digital signal to both an electrical digital signal and into said optical digital signal, wherein either or both of said signals can be provided as a device output.

4. (Original) An electronic system, as recited in claim 1, wherein said magnetically sensitive portion comprises a magnetically permeable material.

5. (Previously presented) An electronic system, as recited in claim 1, wherein said single device includes a three-terminal light-emitting transistor, said transistor having an emitter, a base, and a collector, wherein said light is emitted from said collector.

6. (Previously presented) An electronic system, as recited in claim 2, wherein said magnetically sensitive portion includes a magnetic switch, wherein switch position is determined by said magnetic digital signal, wherein a first intensity of light is emitted in a first switch position and a second intensity of light is emitted in a second switch position, wherein said first intensity is greater than said second intensity.

7. (Previously presented) An electronic system, as recited in claim 5, wherein said transistor comprises ballistic spin filtering to spin polarize and analyze electrons.

8. (Amended) An electronic system, as recited in claim 7, wherein said ~~transistor~~ magnetically sensitive portion comprises a pair of magnetically permeable layers, wherein when said magnetically permeable layers are aligned said spin polarized electrons penetrate and when anti-aligned, said spin polarized electrons are attenuated.

9. (Withdrawn) An electronic system, as recited in claim 8, wherein said magnetically permeable layers are both located in said base.

10. (Original) An electronic system, as recited in claim 8, wherein one of said pair of magnetically permeable layers is located in said base and one of said pair of magnetically permeable layers is located in said emitter.

11. (Original) An electronic system, as recited in claim 5, wherein said emitter is tunnel coupled to said base across an insulator.

12. (Previously presented) n electronic system, as recited in claim 5, wherein said single device includes a buried quantum well within a semiconductor collector, wherein said quantum well is formed of a quantum well material having a lower band gap than adjacent material.

13. (Original) An electronic system, as recited in claim 12, wherein said material having a lower band gap has a direct transition for more efficient generation of light in said quantum well.

14. (Original) An electronic system, as recited in claim 12, wherein said semiconductor collector further comprises a Schottky contact region.

15. (Original) An electronic system, as recited in claim 14, wherein said semiconductor collector further comprises an n type Schottky contact region, an undoped quantum well region, and a p type substrate layer heterostructure.

16. (Previously presented) n electronic system, as recited in claim 12, wherein said light emitted by said single device comprises photons having an energy approximately equal to said band gap of said quantum well material.

17. (Previously presented) An electronic system, as recited in claim 5, wherein said emitter is capable of providing ballistic electrons across said base to said collector when an emitter-base bias is provided with a potential exceeding said energy barrier.

18. (Previously presented) An electronic system, as recited in claim 17, wherein said energy barrier comprises a base-collector Schottky barrier.

19. (Previously presented) An electronic system, as recited in claim 5, wherein said single device comprises a spin valve transistor having a source for complementary carriers and a place for recombining to generate said photons, wherein said energy barrier comprises a base-collector energy barrier.

20. (Previously presented) An electronic system, as recited in claim 19, wherein said base-collector energy barrier comprises a Schottky barrier, said source for complementary carriers comprises a p-type substrate layer, and said place for recombining comprises a quantum well.

21. (Withdrawn) An electronic system, as recited in claim 19, wherein said spin valve transistor includes a base having a first magnetically permeable layer and a second magnetically permeable layer.

22. (Withdrawn) An electronic system, as recited in claim 21, wherein said first magnetically permeable layer is ferromagnetic.

23. (Withdrawn) An electronic system, as recited in claim 21, wherein said second magnetically permeable layer has a lower coercive field level than said first magnetically permeable layer so said second layer can be switched without switching said first layer to provide for turning on and turning off current in said single device with an intermediate level magnetic field.

24. (Withdrawn) An electronic system, as recited in claim 23, wherein said spin valve transistor includes a base-collector contact comprising a Schottky barrier diode having a Schottky barrier height.

25. (Withdrawn) An electronic system, as recited in claim 24, wherein said Schottky barrier diode provides that only ballistic electrons having energy at least equal to said Schottky barrier height are injected into said collector.

26. (Withdrawn) An electronic system, as recited in claim 25, wherein said transistor comprises a variable emitter-base voltage and an independently variable collector-base voltage.

27. (Withdrawn) An electronic system, as recited in claim 26, wherein said transistor emits photons only when said emitter-base voltage exceeds a threshold approximately equal to the said Schottky barrier height.

28. (Withdrawn) An electronic system, as recited in claim 26, wherein said transistor emits photons only when said collector-base voltage exceeds a threshold approximately equal to the difference between bandgap of said collector and said Schottky barrier height.

29. (Withdrawn) An electronic system, as recited in claim 28, further comprising a first power supply for providing an electrical potential across a collector-base junction of said transistor, wherein when said electrons are injected into said collector over a Schottky barrier with an energy at least equal to energy of said Schottky barrier, the combination of this electron energy and said potential energy provided by said first power supply provides said electrons with enough potential energy to generate photons from recombination in said quantum well.

30. (Withdrawn) An electronic system, as recited in claim 29, further comprising a second power supply for providing an electrical potential across an emitter-base junction of said transistor, wherein said emitter provides ballistic electrons at an energy exceeding said Schottky barrier when sufficient emitter-base potential is provided.

31. (Original) An electronic system, as recited in claim 5, wherein said collector comprises an n type region and a p type region and a region-there-between, wherein said region-there-between has a lower band gap than either said n type region or said p type region so as to trap both electrons and holes for facilitating recombination and photon generation.

32. (Original) An electronic system, as recited in claim 31, wherein said region-there-between is undoped or lightly doped.

33. (Withdrawn) An electronic system, as recited in claim 5, wherein emitter-base contact comprises a second energy barrier.

34. (Withdrawn) An electronic system, as recited in claim 1, wherein said single device comprises a two-terminal light-emitting transistor, said two terminal transistor comprising a base and a collector, wherein said light is emitted from said collector, wherein said base of said two terminal transistor is exposed for receiving sub-band gap photons to provide internal photo-emission of charges in said base.

35. (Withdrawn) An electronic system, as recited in claim 1, wherein said single device is included in a magnetic read head, wherein said single device converts magnetic information into an optical signal.

36. (Withdrawn) An electronic system, as recited in claim 1, further comprising an array of said single devices for storing information and for converting said stored information into optical signals.

37. (Withdrawn) An electronic system, as recited in claim 1, wherein said single device further comprises amplification.

38. (Withdrawn) An electronic system, as recited in claim 1, further comprising a power supply, wherein said single device comprises a collector and a base, wherein said power supply is connected for providing a collector-base voltage sufficient to provide secondary electrons by impact ionization to provide amplification.

39. (Amended) An electronic system, comprising a metal base hot carrier transistor and a source of external magnetic field, said metal base hot carrier transistor having a metal base[[,]] and a collector, an interface there between, wherein ~~and~~ an energy barrier~~, said energy barrier~~ is between said metal base and said collector to block thermalized carriers in said metal base, said collector having a ~~quantum well~~ p region and an n region for facilitating light emission, said metal base hot carrier transistor further comprising a magnetically sensitive portion wherein said source of external magnetic field is positioned to provide a magnetic field parallel to said interface where said external magnetic field intersects said magnetically sensitive portion.

40. (Amended) An electronic system, as recited in claim 39, wherein said transistor comprises a pair of ferromagnetic layers wherein a change in said external magnetic field can switch magnetization orientation of one of said layers ~~can have its magnetization orientation switched~~ independently of the other layer to facilitate magnetic switching between a first magnetic switch position and a second magnetic switch position.

41. (Previously presented) An electronic system, as recited in claim 40, wherein a first intensity of light is emitted in said first magnetic switch position and a second intensity of light is emitted in said second magnetic switch position, wherein said first intensity of light is greater than said second intensity of light.

42. (Withdrawn) An electronic system, as recited in claim 39, wherein said transistor comprises ballistic spin filtering to spin polarize and analyze said carriers.

43. (Original) An electronic system, as recited in claim 39, wherein said metal base comprises a ferromagnetic layer.

44. (Withdrawn) An electronic system, as recited in claim 39, wherein said metal base comprises a pair of magnetically permeable layers, wherein when said magnetically permeable layers are aligned spin polarized carriers penetrate and when anti-aligned, spin polarized carriers are attenuated.

45. (Withdrawn) An electronic system, as recited in claim 39, wherein said transistor is included in a magnetic read head, wherein said transistor converts magnetic information into an optical signal.

46. (Withdrawn) An electronic system, as recited in claim 39, further comprising an array of said transistors for storing information and for converting said stored information into optical signals.

47. (Withdrawn) An electronic system, as recited in claim 39, wherein said transistor further comprises amplification.

48. (Previously presented) An electronic system, as recited in claim 47, wherein said transistor comprises a power supply for providing a collector-base voltage sufficient to provide secondary electrons by impact ionization to provide said amplification.

49.-56. Cancel

57. (Amended) An electronic system, as recited in claim ~~55, wherein said spin filter comprises a ferromagnetic layer located in said metal base~~ 39, wherein a change in said external magnetic field is capable of switching magnetization orientation of said magnetically sensitive portion.

58. (Amended) An electronic system, as recited in claim ~~55~~ 39, wherein said metal base hot carrier transistor comprises a pair of magnetically permeable layers, wherein when said magnetically permeable layers are aligned, hot carriers penetrate and when said magnetically permeable layers are anti-aligned, said hot carriers are attenuated, wherein said external magnetic field is capable of switching magnetization orientation to align and to anti-align said magnetically permeable layers.

59. (Amended) An electronic system, as recited in claim ~~55~~ 39, wherein said metal base hot carrier transistor further includes a spin filter, wherein said spin filter includes a pair of ferromagnetic layers, wherein a change in said external magnetic field can switch magnetization orientation of one of said ferromagnetic layers ~~is capable of having its magnetization orientation switched~~ independently of the other ferromagnetic layer to facilitate magnetic switching between a first magnetic switch position and a second magnetic switch position.

60. (Previously presented) An electronic system, as recited in claim 59, wherein a first intensity of light is emitted in said first magnetic switch position and a second intensity of light is emitted in said second magnetic switch position, wherein said first intensity of light is greater than said second intensity of light.

61.-63 cancel

64. (Previously presented) An electronic system, as recited in claim 1, further comprising an optical structure, wherein said optical structure is arranged to collect light emitted by said light emitting portion.

65. (Amended) An electronic system, as recited in claim 39, wherein said collector includes a quantum well, further comprising an optical structure, wherein said optical structure is arranged to collect light emitted by said quantum well.

66. (Amended) An electronic system, as recited in claim ~~39, wherein said transistor further comprises amplification~~ 9, wherein said magnetically permeable layers are separated by a non-magnetically permeable spacer layer there between.

67. (Amended) An electronic system, as recited in claim ~~39, wherein said transistor comprises a power supply for providing a collector-base voltage sufficient to provide secondary electrons by impact ionization to provide said amplification~~ 44, wherein said magnetically permeable layers are separated by a non-magnetically permeable spacer layer there between.